8

$$\frac{dy}{dx} = e^{x-y} \quad \text{pt. } (0, 2)$$

$$= e^x \cdot e^{-y}$$

$$dx \cdot \frac{dy}{dx} = \frac{e^x}{e^y} \cdot e^y$$

$$\int dy(e^y) = \int dx(e^x)$$

$$e^y = e^x$$

$$e^2 = e^0 + C$$

$$\boxed{e^2 = 1 + C}$$

$$C = e^2 - 1$$

$$\ln e^y = \ln e^x + e^2 - 1$$

$$y = \ln(e^x + e^2 - 1)$$

Newton's Law of Cooling

$$\frac{dy}{dx} = ky \rightarrow y = y_0 e^{kt}$$

$$\frac{dT}{dt} = k(T - T_s)$$

T = temp of item

T_s = temp of surrounding

t = time

k = some constant

$$d(T) = d(T - T_s)$$

$$\frac{d(T - T_s)}{dt} = k(T - T_s)$$

$$\boxed{T - T_s = (T_0 - T_s)e^{kt}}$$

Newton's Law of Cooling

(32) ingot of silver is 60°C above room temp., 20 min ago it was 70° above room temp. How far above room temp will it be in 2 hours from start.

$T_0 - T_s = 70°$

$t = 20\text{min}, \frac{1}{3}\text{hr.}$

find $T - T_s$ in 2 hours

$$(T - T_s) = 70e^{-k \cdot 2}$$

$$60 = 70e^{-k \cdot \frac{1}{3}}$$

find k

$$\frac{60}{70} = e^{-k \cdot \frac{1}{3}}$$

$$\ln\left(\frac{6}{7}\right) = -k \cdot \frac{1}{3}$$

$$-3\ln\left(\frac{6}{7}\right) = k$$

$$\boxed{k = 0.4625}$$

$$(T - T_s) = 70e^{-0.4625(2)}$$

$T - T_s = 27.760$ C° above room temp.

We skipped choosing a base → so read this

Do 6.4 # 1–10 (all), 11, 14, 15, 18, 19, 22, 23, 31, 33, 46